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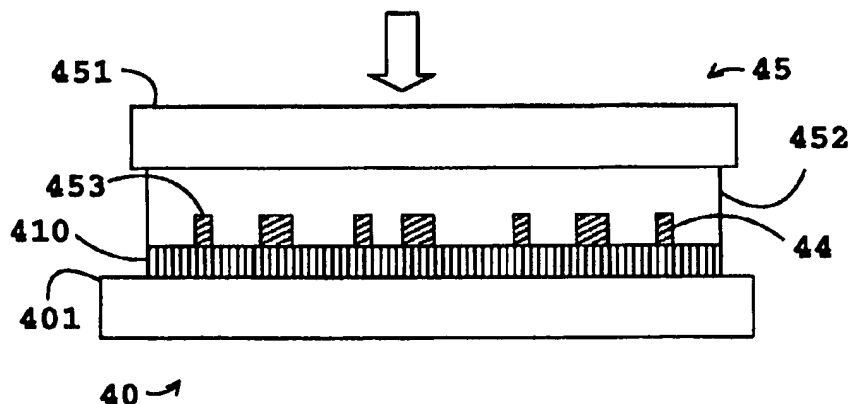
L Number	Hits	Search Text	DB	Time stamp
1	59	(michel near1 bruno or heinz near1 schmid or emmanuel near1 delamarche or alexander near1 bietsch).in.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/11/06 12:34
2	1198	(216/41 or 216/44 or 216/45 or 216/54).ccls.	USPAT; US-PGPUB	2003/11/06 12:55
3	66	((216/41 or 216/44 or 216/45 or 216/54).ccls.) and stamp\$	USPAT; US-PGPUB	2003/11/06 13:02
4	889	(101/327 or 101/333 or 101/401 or 101/405).ccls.	USPAT; US-PGPUB	2003/11/06 13:05
5	286	stamp\$ near10 (microcontact\$ or lithography)	USPAT; US-PGPUB	2003/11/06 13:10
6	113	stamp\$ near10 (microcontact\$)	USPAT; US-PGPUB	2003/11/06 13:06
7	127	stamp\$ and soft near5 lithography	USPAT; US-PGPUB	2003/11/06 13:14
8	264	stamp\$ and force near5 transducer	USPAT; US-PGPUB	2003/11/06 13:14
9	175	stamp\$ and force near2 transducer	USPAT; US-PGPUB	2003/11/06 13:19
10	1057	stamp\$ same (stretch\$ or prestretch\$)	USPAT; US-PGPUB	2003/11/06 13:19
11	195	stamp same (stretch\$ or prestretch\$)	USPAT; US-PGPUB	2003/11/06 13:20



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : B41K 1/00, G03F 7/00, H01L 21/768, B41C 1/02	A1	(11) International Publication Number: WO 97/06013 (43) International Publication Date: 20 February 1997 (20.02.97)
(21) International Application Number: PCT/IB95/00610 (22) International Filing Date: 4 August 1995 (04.08.95) (71) Applicant: INTERNATIONAL BUSINESS MACHINES CORPORATION [US/US]; Old Orchard Road, Armond, NY 10504 (US). (72) Inventors: BIEBUYCK, Hans, Andre; Mythenstrasse 8, CH-8800 Thalwil (CH). MICHEL, Bruno; Obstgartenweg 13, CH-8136 Gattikon (CH). (74) Agent: BARTH, Carl, Otto; International Business Machines Corporation, Säumerstrasse 4, CH-8803 Rüschlikon (CH).		(81) Designated States: JP, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report.</i>

(54) Title: LITHOGRAPHIC SURFACE OR THIN LAYER MODIFICATION



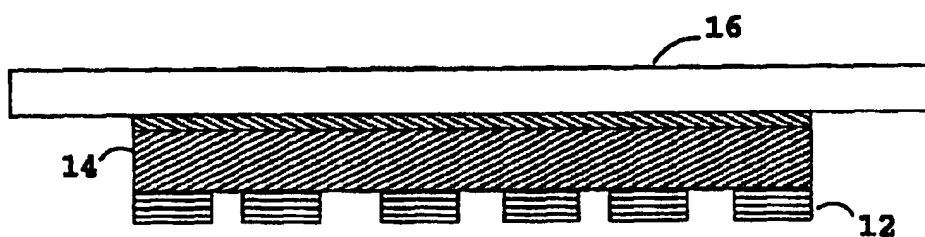
(57) Abstract

A process for producing lithographic features in a substrate layer is described, comprising the steps of lowering a stamp (15) carrying a reactant (14) onto a substrate (10), confining the subsequent reaction to the desired pattern, lifting said stamp and removing the debris of the reaction from the substrate. Preferably, the stamp carries the pattern to be etched or depressions corresponding to such a pattern. Using the described methods, patterns with submicron features can be generated. The method allows a general solution to parallel handling and transfer of materials in a variety of technical fields.



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : B41K 1/00, G03F 7/00, H01L 21/768, B41C 1/02	A1	(11) International Publication Number: WO 97/06012 (43) International Publication Date: 20 February 1997 (20.02.97)
(21) International Application Number: PCT/IB95/00609 (22) International Filing Date: 4 August 1995 (04.08.95) (71) Applicant: INTERNATIONAL BUSINESS MACHINES CORPORATION [US/US]; Old Orchard Road, Armonk, NY 10504 (US). (72) Inventors: BIEBUYCK, Hans, Andre; Mythenstrasse 8, CH-8800 Thalwil (CH). MICHEL, Bruno; Obstgartenweg 13, CH-8136 Gattikon (CH). (74) Agent: BARTH, Carl, Otto; International Business Machines Corporation, Säumerstrasse 4, CH-8803 Rüschlikon (CH).		(81) Designated States: JP, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report.</i>

(54) Title: STAMP FOR A LITHOGRAPHIC PROCESS**(57) Abstract**

A hybrid stamp structure for lithographic processing of features below 1 micron is described, comprising an deformable layer (14) for accommodating unevenness of the surface of a substrate and of the stamp structure itself, and a patterned layer (12) in which a lithographic pattern is engraved. The stamp structure is further enhanced by comprising a third layer (16), which acts as rigid support for the stamp, thus preventing an undesired deformation of the stamp under load.



US 20030127002A1

(19) **United States**(12) **Patent Application Publication****Hougham et al.**(10) Pub. No.: **US 2003/0127002 A1**

(43) Pub. Date:

Jul. 10, 2003(54) **MULTILAYER ARCHITECTURE FOR MICROCONTACT PRINTING STAMPS**

(52) U.S. Cl. 101/327

(76) Inventors: **Gareth Geoffrey Hougham**, Ossining, NY (US); **Mary Elizabeth Rothwell**, Ridgefield, CT (US); **Ronald Wayne Nunes**, Hopewell Junction, NY (US)

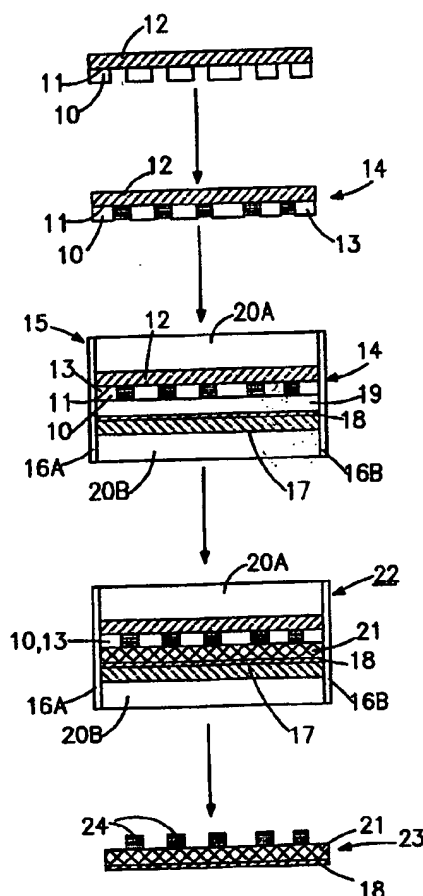
(57)

ABSTRACT

Correspondence Address:

Alvin J. Riddles**Candlewood Isle****Box 34****New Fairfield, CT 06812 (US)**(21) Appl. No.: **10/037,251**(22) Filed: **Jan. 4, 2002****Publication Classification**(51) Int. Cl.⁷ **B41K 1/38**

A layered structure and process for a microcontact printing stamp has individual layers chosen to impart particular properties such as one layer chosen for surface properties and another layer chosen for bulk mechanical properties. The invention is fabricated through having a first layer with coatable properties and a subsequent layer with injectable properties resulting in a layered structure wherein the layer at the surface has optimized surface properties and is positioned on an underlying layer with carefully chosen bulk mechanical properties, and other unique functional properties can be imparted through an intermediate layer. A fabrication process is provided that employs a coating capability for one portion, an injection capability for another property and a porosity property for still another portion.





(19) **United States**

(12) **Patent Application Publication**
Myerson

(10) Pub. No.: US 2003/0170999 A1

(43) Pub. Date: **Sep. 11, 2003**

(54) MOLECULAR CRYSTALS OF CONTROLLED SIZE

(57) **ABSTRACT**

(76) Inventor: **Allan S. Myerson**, Chicago, IL (US)

Correspondence Address:
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P O BOX 567685
ATLANTA, GA 311567685

(21) Appl. No.: 10/093,979

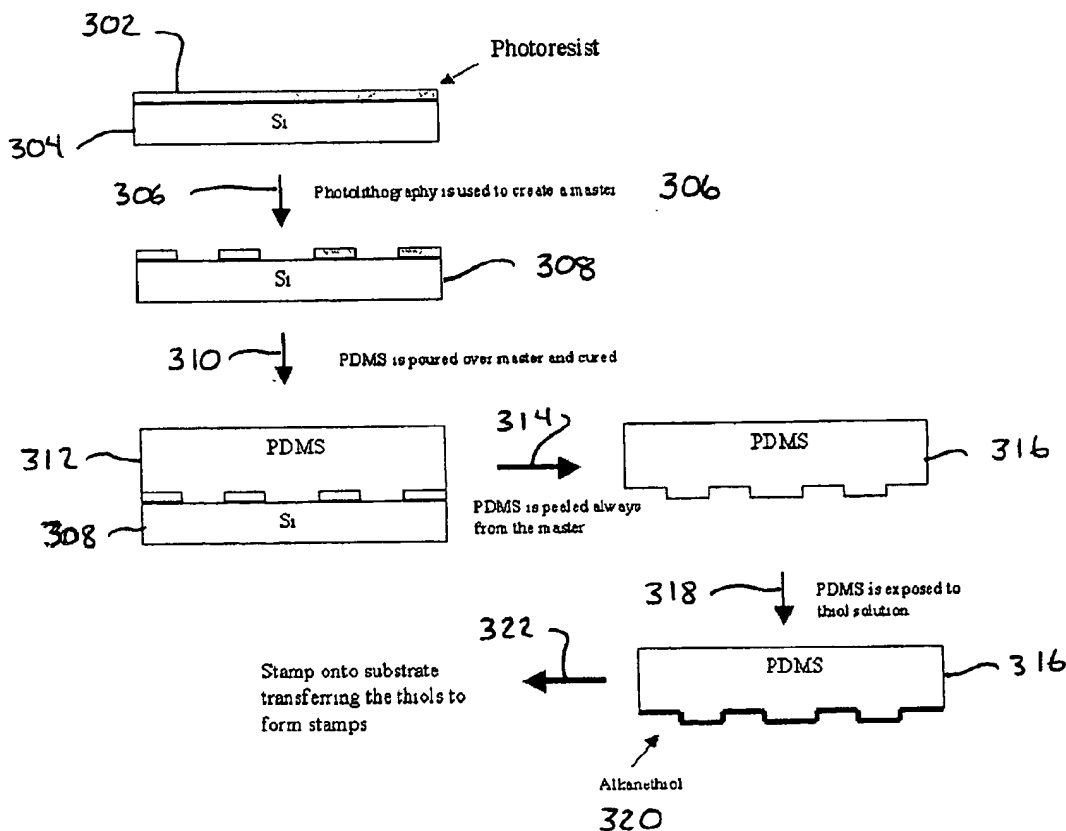
(22) Filed: Mar. 7, 2002

Publication Classification

(51) Int. Cl.⁷ C30B 7/00; C30B 21/02;
C30B 28/06; C01B 6/10; H01L 21/302;
H01L 21/461

(52) U.S. Cl. 438/712; 438/708

Methods for the crystallization of nano-size crystals of molecular organic compounds while operating at a low supersaturation. The methods are based on controlling the domain size available during the crystallization process. In one exemplary method, microcontacted printed self-assembled monolayers (SAMs) with local domain area sizes ranging up to $2500\text{ }\mu\text{m}^2$ and fabricated SAMs generated from electron beam lithography, are employed to control the size, orientation, phase, and morphology of the crystal. In another exemplary method, a continuous micro-crystallizer having a vessel diameter of 25 microns or less is used to ensure that the maximum size of the crystals in at least one dimension, and preferably two dimensions is constrained by the vessel itself. The methods allow control of supersaturation and growth conditions, as well as manageability over crystallinity and polymorphism, and each method's domain size has the potential for further reduction.





US 20030152703A1

(19) **United States**(12) **Patent Application Publication** (10) **Pub. No.: US 2003/0152703 A1**
Hammond et al. (43) **Pub. Date: Aug. 14, 2003**(54) **PRODUCTION OF CHEMICALLY
PATTERNED SURFACES USING
POLYMER-ON-POLYMER STAMPING****Related U.S. Application Data**(60) Provisional application No. 60/335,020, filed on Oct.
31, 2001.(76) **Inventors: Paula T. Hammond, Newton, MA**
(US); Xueping Jiang, Wilmington, DE
(US); Haipeng Zheng, Cambridge, MA
(US); Shoshana Gourdin, Cambridge,
MA (US)**Publication Classification**(51) **Int. Cl.⁷ B05D 5/00**
(52) **U.S. Cl. 427/256****Correspondence Address:**
Dana M. Gordon, Ph.D., J.D.
Foley Hoag LLP
155 Seaport Boulevard
Boston, MA 02210 (US)(21) **Appl. No.: 10/285,337**
(22) **Filed: Oct. 31, 2002**(57) **ABSTRACT**

One aspect of the present invention relates to a method of creating patterned composite structures on a surface via layer-by-layer deposition of thin films. In certain embodiments, the surface is chemically patterned by the direct stamping of functional polymers on the surface film. A pattern may then be used as a template for the further depositions of materials on the surface. This concept may be applied to various functional polymer and substrate systems as well as various thin film deposition techniques.



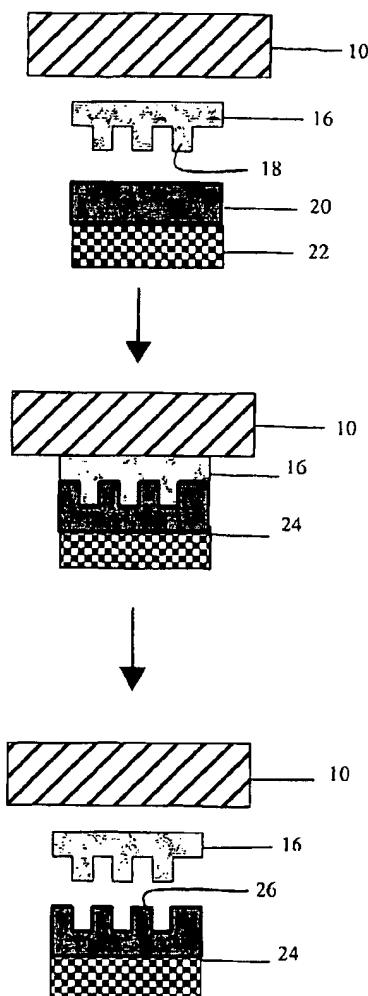
US 20030071016A1

(19) **United States**(12) **Patent Application Publication** (10) Pub. No.: **US 2003/0071016 A1**
Shih et al. (43) Pub. Date: **Apr. 17, 2003**(54) **PATTERNED STRUCTURE REPRODUCTION
USING NONSTICKING MOLD****Publication Classification**(76) Inventors: **Wu-Sheng Shih**, Rolla, MO (US);
James E. Lamb III, Rolla, MO (US);
Mark Daffron, Rolla, MO (US)(51) Int. Cl.⁷ **C03C 25/68**
(52) U.S. Cl. **216/54**Correspondence Address:
HOVEY WILLIAMS TIMMONS & COLLINS
2405 GRAND BLVD., SUITE 400
KANSAS CITY, MO 64108(57) **ABSTRACT**

Novel nonstick molds and methods of forming and using such molds are provided. The molds are formed of a nonstick material such as those selected from the group consisting of fluoropolymers, fluorinated siloxane polymers, silicones, and mixtures thereof. The nonstick mold is imprinted with a negative image of a master mold, where the master mold is designed to have a topography pattern corresponding to that desired on the surface of a microelectronic substrate. The nonstick mold is then used to transfer the pattern or image to a flowable film on the substrate surface. This film is subsequently cured or hardened, resulting in the desired pattern ready for further processing.

(21) Appl. No.: **10/267,953**(22) Filed: **Oct. 8, 2002****Related U.S. Application Data**

(60) Provisional application No. 60/328,841, filed on Oct. 11, 2001.





US006599824B1

(12) **United States Patent**
Krivokapic

(10) **Patent No.:** **US 6,599,824 B1**

(45) **Date of Patent:** **Jul. 29, 2003**

(54) **SYSTEM FOR AND METHOD OF FORMING
LOCAL INTERCONNECT USING
MICROCONTACT PRINTING**

6,060,121 A * 5/2000 Hidber et al.
6,180,494 B1 * 1/2001 Manning 438/443

* cited by examiner

(75) **Inventor:** **Zoran Krivokapic**, Santa Clara, CA
(US)

(73) **Assignee:** **Advanced Micro Devices, Inc.**,
Sunnyvale, CA (US)

Primary Examiner—George Fourson
Assistant Examiner—Khiem Nguyen
(74) *Attorney, Agent, or Firm*—Foley & Lardner

(*) **Notice:** Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 62 days.

(57) **ABSTRACT**

The disclosure relates to a system for and a method of forming a local interconnect in an integrated circuit using microcontact printing. An exemplary method of the disclosure can include applying an active agent to a stamp, stamping the stamp on a portion of an integrated circuit wafer to form an aperture in a layer of material on the integrated circuit wafer, and providing a conductive material in the aperture formed by the stamp. The stamp preferably has a wedge-shaped extrusion with a length corresponding to a length of an interconnect to be formed in the portion of the integrated circuit wafer. The conductive material in the aperture defines the interconnect. In one example, the interconnect can be as narrow as 20 to 50 nanometers (nm).

(21) **Appl. No.:** **09/793,054**

(22) **Filed:** **Feb. 26, 2001**

(51) **Int. Cl.**⁷ **H01L 21/4763**

(52) **U.S. Cl.** **438/618; 438/637; 438/629;**
438/678

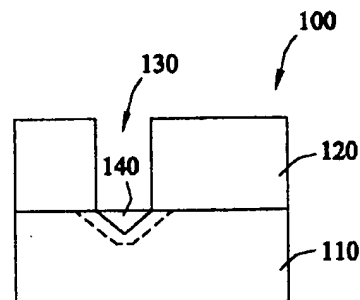
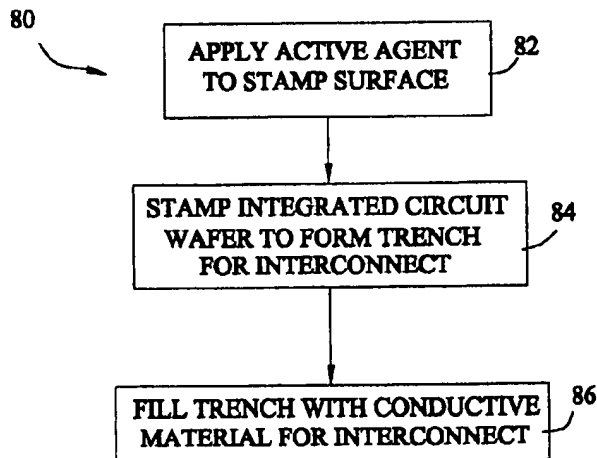
(58) **Field of Search** **438/261, 640,**
438/618, 637, 629, 678

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5,512,131 A * 4/1996 Kumar et al.

20 Claims, 3 Drawing Sheets





US006180239B1

(12) **United States Patent**
Whitesides et al.

(10) **Patent No.:** US 6,180,239 B1
(45) **Date of Patent:** *Jan. 30, 2001

(54) **MICROCONTACT PRINTING ON SURFACES
AND DERIVATIVE ARTICLES**

(75) **Inventors:** George M. Whitesides, Newton;
Younan Xia, Cambridge, both of MA
(US); James L. Wilbur, Germantown,
MD (US); Rebecca J. Jackman;
Enoch Kim, both of Boston, MA (US);
Mara G. Prentiss, Cambridge, MA
(US); Milan Mrksich, Chicago, IL
(US); Amit Kumar, MilPitas, CA (US);
Christopher B. Gorman, Raleigh, NC
(US); Hans Bleibuyck, Thalwil (CH);
Karl K. Berggren, Cambridge, MA
(US)

(73) **Assignee:** President and Fellows of Harvard
College, Cambridge, MA (US)

(*) **Notice:** This patent issued on a continued prosecution application filed under 37 CFR 1.53(d), and is subject to the twenty year patent term provisions of 35 U.S.C. 154(a)(2).

Under 35 U.S.C. 154(b), the term of this patent shall be extended for 0 days.

(21) **Appl. No.:** 08/676,951

(22) **Filed:** Jul. 8, 1996

Related U.S. Application Data

(63) Continuation-in-part of application No. 08/397,635, filed on Mar. 1, 1995, now abandoned, which is a continuation-in-part of application No. 08/131,841, filed on Oct. 4, 1993, now Pat. No. 5,512,131.

(51) **Int. Cl.⁷** B32B 9/04; B41L 42/02

(52) **U.S. Cl.** 428/411.1; 428/195; 101/368;
101/378; 101/379

(58) **Field of Search** 428/411.1, 195;
101/368, 376, 378, 379

(56) **References Cited**

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2,905,539 9/1959 Bowerman 174/250

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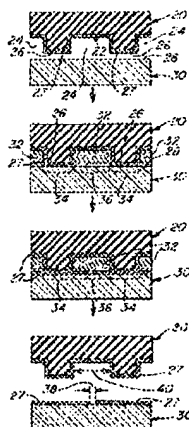
Primary Examiner—Mark Chapman

(74) *Attorney, Agent, or Firm*—Wolf, Greenfield & Sacks, P.C.

(57) **ABSTRACT**

Improved method of forming a patterned self-assembled monolayer on a surface and derivative articles are provided. According to one method, an elastomeric stamp is deformed during and/or prior to using the stamp to print a self-assembled molecular monolayer on a surface. According to another method, during monolayer printing the surface is contacted with a liquid that is immiscible with the molecular monolayer-forming species to effect controlled reactive spreading of the monolayer on the surface. Methods of printing self-assembled molecular monolayers on nonplanar surfaces and derivative articles are provided, as are methods of etching surfaces patterned with self-assembled monolayers, including methods of etching silicon. Optical elements including flexible diffraction gratings, mirrors, and lenses are provided, as are methods for forming optical devices and other articles using lithographic molding. A method for controlling the shape of a liquid on the surface of an article is provided, involving applying the liquid to a self-assembled monolayer on the surface, and controlling the electrical potential of the surface.

41 Claims, 13 Drawing Sheets



US-PAT-NO: 6180239

DOCUMENT-IDENTIFIER: US 6180239 B1

TITLE: Microcontact printing on surfaces
and derivative articles

----- KWIC -----

Detailed Description Text - DETX (17):

Although only compressive forces are described with
respect to deformation
of stamp 20 during microprinting, stamp 20 can be deformed
by stretching, as
well.



US005900160A

United States Patent [19]

Whitesides et al.

[11] Patent Number: 5,900,160

[45] Date of Patent: * May 4, 1999

[54] METHODS OF ETCHING ARTICLES VIA MICROCONTACT PRINTING

[75] Inventors: George M. Whitesides, Newton; Younan Xia, Cambridge, both of Mass.; James L. Wilbur, Germantown, Md.; Rebecca J. Jackman; Enoch Kim, both of Boston, Mass.; Mara G. Prentiss, Cambridge, Mass.; Milan Mrksich, Chicago, Ill.; Amit Kumar, Milpitas, Calif.; Christopher B. Gorman, Raleigh, N.C.; Hans Blebueck, Thalwil, Switzerland; Karl K. Berggren, Cambridge, Mass.

[73] Assignee: President and fellows of Harvard College, Cambridge, Mass.

[*] Notice: This patent is subject to a terminal disclaimer.

[21] Appl. No.: 08/677,309

[22] Filed: Jul. 9, 1996

Related U.S. Application Data

[63] Continuation of application No. 08/676,951, Jul. 8, 1996, which is a continuation-in-part of application No. 08/397,635, Mar. 1, 1995, abandoned, which is a continuation-in-part of application No. 08/131,841, Oct. 4, 1993, Pat. No. 5,512,131.

[51] Int. Cl.⁶ B44C 1/22

[52] U.S. Cl. 216/41; 216/33; 216/87

[58] Field of Search 216/41, 33, 87, 216/13, 96, 36

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2210302	8/1990	Japan
WO 95/12480	5/1995	WIPO
WO 97/07429	2/1997	WIPO

Primary Examiner—M. Nuzzolillo

Assistant Examiner—Laura Weiner

Attorney, Agent, or Firm—Wolf, Greenfield & Sacks, P.C.

[57] ABSTRACT

Improved methods of forming a patterned self-assembled monolayer on a surface and derivative articles are provided. According to one method, an elastomeric stamp is deformed during and/or prior to using the stamp to print a self-assembled molecular monolayer on a surface. According to another method, during monolayer printing the surface is contacted with a liquid that is immiscible with the molecular monolayer-forming species to effect controlled reactive spreading of the monolayer on the surface. Methods of printing self-assembled molecular monolayers on nonplanar surfaces and derivative articles are provided, as are methods of etching surfaces patterned with self-assembled monolayers, including methods of etching silicon. Optical elements including flexible diffraction gratings, mirrors, and lenses are provided, as are methods for forming optical devices and other articles using lithographic molding. A method for controlling the shape of a liquid on the surface of an article is provided, involving applying the liquid to a self-assembled monolayer on the surface, and controlling the electrical potential of the surface.

27 Claims, 13 Drawing Sheets

